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ABSTRACT

The impact of surface and reflective teaching and learning on students' academic success was studied with 178 students in grades 6 through 8 at a middle school in Tennessee. Students were surveyed to determine their experiences in the classroom with regard to surface or reflective teaching in their Language Arts, Mathematics, Science, and Social Studies classes, Each student completed the Surface or Reflective Teaching Survey (SORTS) in each class. Teachers were encouraged to participate and asked to compete the SORTS from a teacher perspective. The teacher participation rate was 98%. Teachers received class level averages from their classes, which enabled them to reflect on student perceptions of their teaching and make any pedagogical adjustments they deemed necessary. The survey process was repeated in April to see if the feedback had any effect on surface and reflective teaching and learning. Students' semester grade reports were obtained, and the relationships between students' level of learning, teachers' level of teaching, and student academic outcomes were determined, as was change in student perception to see if this was related to learning outcomes. The surface learning environment, or transmission of data approach, in mathematics and science was significantly associated with successful student learning outcomes. The reflective learning environment, or construction of knowledge approach, was significantly associated with successful student learning outcomes in Social Studies and Language Arts. Teachers believed there was a linkage between reflective learning environments and higher student learning outcomes, and the study supports this belief. (Contains 13 references.) (SLD)

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The Impact of Surface and Reflective Teaching and Learning on Student Academic Success

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Paper presented at the annual meeting of the
Mid-South Educational Research Association
Chattanooga, TN, November 2002

'The Impact of Surface and Reflective Teaching and Learning on Student Academic Success'

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Presented at the MSERA 2002 Annual Meeting in Chattanooga, November 6, 2002.

Abstract

XXX Middle School in Tennessee became a research site to assess the impact of surface and reflective teaching and learning on students' academic successes in their 6^{th} – 8^{th} grade classes. The student population participation rate was 92%. Each student was surveyed to ascertain their experiences in the classroom as it related to surface or reflective teaching and learning in their Language Arts, Mathematics, Science, and Social Studies classes. Each student completed the Surface or Reflective Teaching Survey (SORTS) in each of his/her classes. Each survey was completed in ten minutes, and the entire data collection process was completed in forty minutes.

All teachers were encouraged to participate and complete the SORTS instrument from their perspectives. Teacher participation rate was 98%. Participating teachers received class level averages of their classes. This enabled the teachers to reflect on student perceptions of their teaching activities and make any pedagogical adjustments they deem necessary.

The students and teachers were re-surveyed in April students to ascertain if the feedback has had any effect on teachers and students surface and reflective teaching and learning. Students' semester grade reports were obtained and the relationship between students' level of learning, teachers' level of teaching and student academic achievement outcomes were determined. Also change in students' perceptions was tested to ascertain if it was significantly related to student learning outcomes.

Multiple Regression Equations:

(Note: ONLY students' perceptions were significantly related to student learning outcomes.)

Student grade (Social studies semester) = .567(Reflective) + (.125)(Surface) + .error

R^2 = .546.

Student grade (Language Arts semester) = .683(Reflective) + (.105)(Surface) + error

R^2 = .739

Student grade (Math semester) = .219(Reflective) + .767(Surface) + .error

$R^2 = .328$.

Student grade (Science semester) = .319(Reflective) + .467(Surface) + error

$R^2 = .228$.

Genesis and Background of the Study

The genesis of this study is a series of studies by Smith, Odhiamdo, and El Khateeb (2000, 2001) that found that multi-faceted explanations of the learning environment were not successful in explaining student learning outcomes. Smith, et al (2000, 2001) found that factors tentatively identified as "meta-cognitive awareness' and 'active construction' were significantly related to student learning outcomes. Using the prior findings and instrument, an instrument was constructed using item statements that were associated with either meta-cognitive awareness which was re-named reflective actions or active construction, which was re-named surface actions.

Dewey defined reflective thought as 'active, persistent, and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it and the further conclusions to which it tends' (Dewey 1933: 118). Reflection is widely seen as a key aspect of individual learning (Kolb, 1984: Honey and Mumford, 1992: 1996), Organisational learning (e.g. Senge, 1990; Daudelin, 1996), Learning Organisations (Pedlar, Burgoyne, and Boydell, 1997) for learning strategies (e.g. Kolb, 1984; Honey and Mumford, 1996), and in techniques such as action learning (Weinstein, 1995). The use of reflection is also linked to success of learning (Kolb, 1984; Honey and Mumford, 1996).

Reflection is seen to contribute as much to learning as experience does (e.g. Bandura, 1986, 1977). In Bandura's Social Learning Theory learners are active observers and learn from observing others. The concept of reflection has been seen in a number of different ways. Daudelin (2001) sees reflection arising from a nagging unresolved problem. According to Daudelin, reflection proceeds through four distinct stages: articulation of the problem, analysis of the problem, formulation and testing of a tentative theory to explain the problem and deciding whether to act or not. Work by Kolb (1984) has been useful in the development and use of reflection in learning. For Kolb (1984, p 38) it is a process whereby "knowledge is created through the transformation of experience", in which reflection plays a central role. Schon sees two types of reflective processes: refection-on-action and reflection-in-action. Reflection-on-action describes the process of reflection, which takes place after the event and which the student makes explicit and uses to evaluate the theories of action used to solve a problem. Reflection-in-action describes interaction with a "live" problem as it unfolds.

The relationships between the approach students take to learning and the way in which they learn has been researched since the 70's. Distinction has been made in the literature between surface, strategic and deep or reflective learning. According to Andrews, Garrison, and Magnusson (1996, p83), " students who assume a deep approach are intrinsically motivated and search for meaning by integrating new information with existing knowledge. Surface learners are extrinsically motivated (largely by grades)". Deep learners maximize understanding, focus on meaning rather than literal aspects, read widely, discuss, reflect, integrate, elaborate and use information. On the other hand, surface learners focus on selected details and reproduce accurately, learning by rote memorization. Different types of deep and surface learning have been identified in relation to learning outcomes (Biggs and Collis 1982) and learning conceptions (Van Rossum and Schenk, 1984). Biggs and Collis identify five categories of learning outcome: prestructural, unistructural, multistructural, relational and extended abstract. Deep learning is reflected in the last two. Vermunt (1998) identifies four learning components, which in sum make up a learning style: cognitive processing activities, metacognitive regulation activities, mental models of learning and learning orientations. According to Vermunt, cognitive processing is mainly influenced by the regulation strategies that learners employ. Those who are self- regulated are more likely to attain deep learning than those who are externally regulated. The way in which students perceive learning and their learning orientation influence their metacognitive activities and through these, their critical processing. Vermunt's meaning directed learning style combines " the use of a deep processing strategy (relating, structuring, critical processing), self-regulation of one's own learning process, a learning conception in which learning is seen as constructing one's own knowledge, and a personally constructed learning orientation"(Vermunt and Verloop 1999: 264).

Research Questions

RQ1: Are students' perceptions of the teaching/learning environment predictors of their learning outcomes?

RQ2: Are teachers' perceptions of the teaching/learning environment predictors of their students' learning outcomes?

RQ3: Is the change in students' perceptions of the teaching/learning environment predictors of their learning outcomes?

Hypotheses

H_1 –Students' perceptions of the reflective teaching/learning environment are not a significant predictor of their grades in science, mathematics, language arts, and social studies classes.

H_2 - Students' perceptions of the surface teaching/learning environment are not a significant predictor of their grades in science, mathematics, language arts, and social studies classes.

H_3 – Teachers' perceptions of the reflective teaching/learning environment are not a significant predictor of their grades in science, mathematics, language arts, and social studies classes.

H_4 – Teachers' perceptions of the surface teaching/learning environment are not a significant predictor of their grades in science, mathematics, language arts, and social studies classes.

H_5 – Changes in students' perceptions of the reflective teaching/learning environment is not a significant predictor of their grades in science, mathematics, language arts, and social studies classes.

H_6 – Changes in students' perceptions of the surface teaching/learning environment is not a significant predictor of their grades in science, mathematics, language arts, and social studies classes.

Methodology

After permission to conduct a research study at XXXX Middle School was granted, all 6th through 8th grade students were solicited to join the research study. 178 of 193 students participated, a 92% acceptance rate. The 167 respondents demographics were European-American (94%), and 11 respondents were other (6%). The minority groups, African-American (n=6) and Asian-American (n=5) were collapsed into the other group due to their small numbers. Genders were equally represented. There were 79 6th grade students, 55 7th grade students, and 44 8th grade students. Data were collected on January 22 and April 15, 2002. Initial data analysis (factor & class level) occurred in January and February 2002. On May 5, 2002, participating students' numerical semester grades in Language Arts, Social Studies, Mathematics, and Science were collected. A second data analysis (factors & grades) was conducted May 7-9, 2002.

Instrument

The data collection instrument SORT (Surface or Reflective Reporting Test) was used. Four surveys were conducted in Social Studies, Mathematics, Language Arts, and Science classes. There were a total of 28 item statements. Two factors were found to be present. These factors are identified as reflective and surface

teaching/learning perceptions. The reflective factor was found to contain 20 item statements and the surface contained 5 item statements. The reflective factor items loaded at rates from .432 to .892. The surface factor items loaded at rates from .332 to .992. The Cronbach alpha reliability coefficient for the reflective factor was .84 and for the surface factor it was .79. All the item statements were measured using a 5-point (0-completely disagree; 1-partially disagree; 2-neither agree nor disagree; 3-partially agree; 4-completely agree). Adding the items' scores, dividing by 80, and then multiplying by 100 generated the reflective factor scores. This produced a ratio score with values from 0 to 100, where 0 means never used and 100 means always used. Adding the items' scores, dividing by 20, and then multiplying by 100 generated the surface factor scores. This produced a ratio score with values from 0 to 100, where 0 means never used and 100 means always used. These scales were used because it is the most recognized scale in the education profession and noneducational professions.

Procedure

All the students completed the instruments in a 40-minute time frame in the school auditorium. The researcher and his associates conducted the survey. The students were informed that their answers would not affect their grades and that their teachers would not have access to classroom level data only. Students' perceptions were revealed by their answers to the item statements. The students answered the item statement for each of the four academic subjects under study.

Statistical Analysis

The statistical analysis of the data revealed two factors for all subject areas. In all subject areas both reflective and surface factors were positively related to student learning outcomes. The reflective factor was more predictive of students learning outcomes in the Language Arts and Social Studies subjects. But in Science and Math the surface factor was more predictive of student learning outcomes. Only in Math, was the students' change in the perceptions of surface teaching/learning significantly related to students learning outcomes.

Multiple regression Equations

Student grade (Social studies semester) = .567(Reflective) + (.125)(Surface) + error (1)

R^2 =.546.

Student grade (Language Arts semester) = .683(Reflective) + (.105)(Surface) + error (2)

R^2 =.739

Student grade (Math semester) = .219(Reflective) + .767(Surface) + error (3)

R^2 =.328.

Student grade (Science semester) = .319(Reflective) + .467(Surface) + error (4)

R^2=.228

Results: Research Questions & Related Hypotheses

RQ1: Are students' perceptions of the teaching/learning environment predictors of their learning outcomes?

H_1 –Students' perceptions of the reflective teaching/learning environment are not a significant predictor of their grades in science, mathematics, language arts, and social studies classes. Rejected, student perceptions are strongly related to learning outcomes.

H_2 - Students' perceptions of the surface teaching/learning environment are not a significant predictor of their grades in science, mathematics, language arts, and social studies classes. Rejected, student perceptions are strongly related to learning outcomes.

RQ2: Are teachers' perceptions of the teaching/learning environment predictors of their students' learning outcomes?

H_3 – Teachers' perceptions of the reflective teaching/learning environment are not a significant predictor of their grades in science, mathematics, language arts, and social studies classes. Retained, teachers' perceptions of the learning environment were not significantly related to student learning outcome.

H_4 – Teachers' perceptions of the surface teaching/learning environment are not a significant predictor of their grades in science, mathematics, language arts, and social studies classes. Retained, teachers' perceptions of the learning environment were not significantly related to student learning outcome.

RQ3: Are the changes in students' perceptions of the teaching/learning environment predictors of their learning outcomes?

H_5 – Changes in students' perceptions of the reflective teaching/learning environment is not a significant predictor of their grades in science, mathematics, language arts, and social studies classes. Retained, student perceptions of the reflective teaching/learning environment were not significantly related to student learning outcomes.

H_6 – Changes in students' perceptions of the surface teaching/learning environment is not a significant predictor of their grades in science, mathematics, language arts, and social studies classes. Retained, student perceptions of the surface teaching/learning environment were not significantly related to student learning outcomes.

NOTE: Student perceptions when calculated as a test-retest coefficient was found to be .92

Discussion

Prior research presented at ELSIN and The American Association for Teaching and Curriculum (Smith, et al, 2000, 2001) has supported the assertion that students' perceptions of the learning environment is significantly linked to student learning outcomes. This research strongly supports the prior assertion. One of the interesting relationships that emerged is the subject specific nature of student perceptions. In Social Studies and Language Arts classes students' reflective scores were the dominant predictor of students learning outcomes. In Math and Science classes the dominant predictor was students' surface scores.

Because the standardized beta coefficients for all the relationships were positive, the student that scored highest in the dominant predictor scored higher in student scores. This research finding supports the assertions made by Smith et al, in 2000 and 2001 that students that match the perceived learning environment will score higher in student learning outcomes and the underlying testing protocols. Successful students in Social Studies and Language Arts classes tend to perceive a reflective learning environment and act accordingly. Conversely, successful students in Science and Math classes tend in perceive a surface learning environment.

Furthermore, the students that were successful in one class were successful in other classes. This supports two positions; 1) successful students are sensitive to the teacher imposed learning environment, and 2) successful students are able to adapt to the extant learning environment to maximize the learning. This research failed to support the common assertion that there is a preferred or more successful manner of teaching that is relevant to each subject area. The description of the successful student significantly changes from subject to subject.

Social Studies & Language Arts

Multiple regression analysis resulted in an equation that predicted 55% of students' Social Studies grades. Another multiple regression analysis resulted in an equation that predicted 74% of students' Language Arts grades.

Student grade (Social studies semester) = .567(Reflective) + (.125)(Surface) + error (1)

$R^2 = .546$.

Student grade (Language Arts semester) = .683(Reflective) + (.105)(Surface) + error (2)

$R^2 = .739$

Successful Social Studies and Language Arts students are students that are reflective on the materials presented and discussed in class. They tended to actively build concepts, present their rationale for their positions, and evaluate the content they are interacting with. Unsuccessful students tended to not do the above things and they tended to look at the materials in a surface, non-reflective manner.

Math and Science

Multiple regression analysis resulted in an equation that predicted 33% of student Math grades. Another multiple regression analysis resulted in an equation that predicted 23% of student science grades.

Student grade (Math semester) = .219(Reflective) + .767(Surface) + error (3)

R^2 =.328.

Student grade (Science semester) = .319(Reflective) + .467(Surface) + error (4)

R^2=.228

Successful Math and science students are students that reacted in a surface manner to the materials presented and practiced in class. They tended to accept course materials in a linear, segmented manner, practice in a hands-on manner without reflection, accepts teachers review and identification of important concepts. Unsuccessful students tended to not do the above things and they tended to look at the materials in a reflective, non-surface manner.

Summary

The surface learning environment or transmission of data approach in teaching Mathematics, and Science was significantly associated with successful student learning outcomes. This supports the assertion that teachers are well-educated professionals and are aware of learning environment their pedagogical techniques will produce. In the teachers' professional opinion there is a linkage between surface learning environments and higher student learning outcomes. The results of this study support the teachers' assertions.

The reflective learning environment or construction of knowledge approach in teaching Social Studies and Language Arts was significantly associated with successful student learning outcomes. This supports the assertion that teachers are well-educated professionals and are aware of learning environment their pedagogical techniques will produce. In the teachers' professional opinion there is a linkage between reflective learning environments and higher student learning outcomes. The results of this study support the teachers' assertions.

If teacher are certain that learning behaviors will help improve students' grades then teaching practices should be modified so that this behavior is encouraged. Teaching methods should encourage students to investigate their learning styles and manners in which they can accentuate their learning outcomes. This study seems to take us back to the use of old methods such as use multiple perspectives to understand your materials, and concentrate on your work.

This research supports the position that the teachers' ways of teaching or methodologies influence students' perception of the learning and what they should do to improve their grade. Teachers' actions are also central to empowering students to believe that they control their academic futures.

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